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Shelf life testing of antibody-functionalized microchips

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An abbreviated version of this protocol was published in Science Advances in Dec 2020

Virus detection using nanoparticles and deep neural network–enabled smartphone system

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Detailed protocol

Shelf-life testing of antibody functionalized microchips.

The stability of antibody-functionalized microchips was evaluated using ZIKV-spiked samples in PBS (pH 7.2) at virus concentration of 10^5 particles/ml. Microchips functionalized with Anti-ZIKV antibody were treated with 1.5 mM trehalose solution then freeze dried using Eyela FD-1000 Freeze Dryer for 12 h. The dried microchips were packed using a FoodSaver Vacuum Storage unit, divided into 4 groups (n = 8 chips) and stored on shelf at room temperature. Each group of stored microchips was tested using the bubble assay for virus detection at different time points of 0, 2, 4, and 6 weeks and the microchips and the generated bubbles were imaged and evaluated using the CNN-NES.

1. Microchips were prepared as mentioned in the manuscript.
2. A ZIKV-spiked PBS stock was prepared and aliquoted into vials.
3. N=8 Chips were tested at Day 0.
4. The channels in remaining chips were flushed with 1.5 mM trehalose solution and incubated for 60 mins at 4° C.
5. Chips were placed in the Eyela FD-1000 Freeze Dryer. Freeze dry cycle was run for ~24 hours. 4° C for 30 mins, -4° C for 30 mins. The temperature was lowered to -45° C at 5° C/min. Held for 3 hours. Vacuum of 60 mTorr was maintained for drying steps. Temperature was ramped to -35° C at 0.1° C/min. Held at this temp for 12 hours. Ramped to 25° C over 6 hours. Left drying at 25° C until collected.
6. The dried microchips were packed using a FoodSaver Vacuum Storage unit, divided into 4 groups (n = 8 chips) and stored on shelf at room temperature.
7. An aliquot of the ZIKV-spiked PBS was tested in each set of chips following the standard protocol followed in the paper at the checkpoint times (exact dates in the table below).

How to cite:（Readers should cite both the Bio-protocol preprint and the original research article where this protocol was used）

1. Shafiee, H. (2021). Shelf life testing of antibody-functionalized microchips. Bio-protocol Preprint. bio-protocol.org/prep731.
2. Draz, M. S., Vasan, A., Muthupandian, A., Kanakasabapathy, M. K., Thirumalaraju, P., Sreeram, A., Krishnakumar, S., Yogesh, V., Lin, W., Yu, X. G., Chung, R. T. and Shafiee, H.(2020). Virus detection using nanoparticles and deep neural network–enabled smartphone system. Science Advances 6(51). DOI: 10.1126/sciadv.abd5354

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